

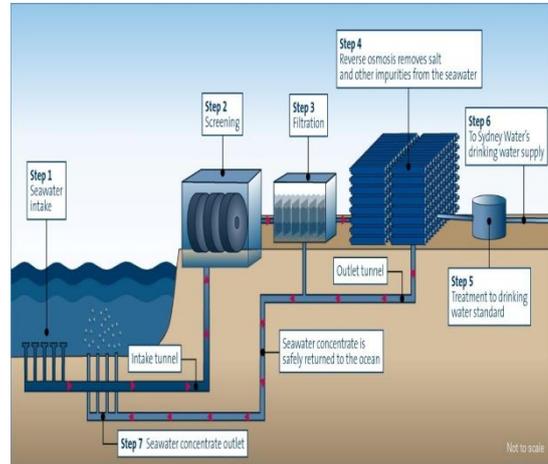
# ARTIFICIAL WATER CYCLE USING PARAFFIN B-WAX

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**ABSTRACT** - Natural water cycle occurs due to evaporation and condensation of ocean water. Desalination occurs when the evaporated water comes down as rain. Thus this process eliminates the contaminants and impurities of ocean water and gives us pure water as a product without any impurities. Hence this process is induced artificially by using solar panels and paraffin wax in our project. This wax is used to emit heat during night time when the sun is off and also the energy from solar panels can be used during night times. The aim of our project is to note how much purification can be done by this process for various contaminated water and also apply it in real world (above drainages or as a small plant above the houses) and interpret the benefit.



**Fig-1: TYPICAL DESALINATION PLANT**

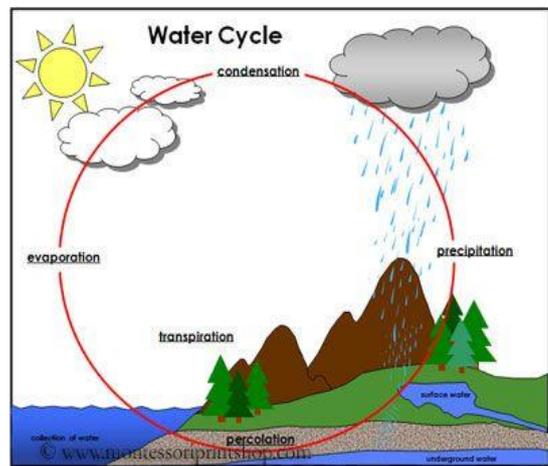
## 1 INTRODUCTION

Water is the most important natural resource for the life to sustain on earth. From the days of the Neanderthal man it is being exploited in at a rate which it does not meet its depletion rate. The melting of ice cap not only decreases the ice cap but also increases the water level in the earth leading to the submersion of coastal areas and causing damage to life on earth. Thus it has become an important responsibility of the human beings to control the exploitation of natural resources and also to find techniques to reuse the resources in a better way. Thus there is a huge need to find new ways to recycle the used resources and utilize it in an effective manner. The experiment here we are introduced is one such method in which water is recycled in a cheaper way in a small scale.

A prototype was created and the experiment was conducted in laboratory condition. The usage of a Phase change material was the experiment done by us. Its exothermic property was used to increase the rate of evaporation in the water. Normal water cycle is the process of purification done by nature. The process is evaporation of ocean water where the salt content is removed and on the condensation of that water is the rain we receive which can be utilized by every living organism on earth.

This water cycle is done in large industries or DESALINATION PLANTS. The cost of it is very high. Thus our idea is to minimize the cost of that process at least in one way like evaporation. The usage of sunlight – artificial heat energy was an appreciable one. This Heat for evaporation is further fostered using the wax we have used. This was found to be quiet appreciable but application of this experiment to large area must be researched for better design and outcome.

First, water on the surface of the Earth evaporates. Evaporation means that the sun heats up the water which turns into gas. Then, water collects as water vapour in the sky. This makes clouds. Next, the water in the clouds gets cold. This makes it become liquid again.



**Fig-2: WATER CYCLE**

This process is called condensation. Then, the water falls from the sky as rain, snow, sleet or hail. This is called precipitation. The water sinks into the surface and also collects into lakes, oceans, or aquifers. It evaporates again and continues the cycle.

## 2 MATERIALS USED FOR THE EXPERIMENT

- TMT rods 8mm dia
- Polythene sheet 400micron thickness

- Sheet metal plates
- Metal tubes
- Paraffin bar wax
- Black paint

**2.2 POLYTHENE SHEETS**

Polythene sheet of thickness 400micron was adopted. This thickness was mainly adopted because it allows the sunrays to pass through it with very less loss of energy. It acts in two ways in the experiment. To transfer the heat without any loss and also to act as a condensation layer of the evaporated water.

**2.3 PARAFFIN BAR WAX**

This is the main component of this experiment. The bar wax is used in industries to coat the yarn in spinning mills. It is available in very cheap rate. The production cost of the material is very less. The exothermic property of the material which means the material melts at a temperature little higher than the normal room temperature and on cooling radiates heat at a greater rate. This heat is sufficient for making the water to get vaporised and make the water free from impurities.

**2.4 SOURCE OF WATER**

All brackish water can be tested in this method if it is done on a large scale. Since it is done at laboratory condition we tested only rain water for this experiment and the result was analyzed.

**2.5 METAL TUBES**

The metal tubes where selected since it allows heat to pass through it. Black paint was coated on it. This sparingly increases the absorption of heat.

**3. EXPERIMENT PROCESS**

- This process was experimented on laboratory condition.
- A small scale evaporation and condensation setup was made at the laboratory.
- The rain water was collected and tested.
- The wax was loaded in metal tubes and was immersed inside the contaminated water.
- Polythene sheet dome structure was used as the sector of condensation.
- TMT rods where used in the designing of dome.

- Sheet metal plates where used as the container for the holding the brackish water and also to collect the evaporated water.
- Only direct source of heat was used in this process and no other artificial means where used.
- The paraffin bar wax was scrapped into powder form because the large size of it can't be melted in an easy way.
- It was powdered and loaded in metal tubes and was sealed with end caps.
- The metal tubes where painted in black colour as it would help in increasing the absorption rate of the heat from sunrays.
- Four such tubes where used in our experiment.
- Sheet metal plates of diameter 30 and 35 cms where designed as trough like structure and was sealed with M-seal to prevent water leakage.
- TMT rod of dia 8mm was used in the preparation of dome.



**Fig-3.1:** PICTURE SHOWING SCRAPPED WAX INSIDE THE METAL-TUBES.



**Fig-3.2:** TRANSPARENT CONDENSATION APPARATUS.

### 3.2 ADVANTAGES

- The main advantage of this process is the cost effectiveness.
- The material cost is so less when compared to other process of desalination or purification process.
- Proper designing of this model can lead to effective output.
- Open Rain water storage tanks can be used to apply this method.
- No toxic substance or any other harmful effects.



Fig 3.3 WAX TUBES

### 3.3 DIS-ADVANTAGES

- Dis-advantage of this process is that the polythene sheet must be replaced or cleaned at correct time.
- The process is a slower one hence it can be used as an additional thing to normal processes.

### 4. FURTHER IMPROVEMENTS

- Further improvements techniques like the transfer of heat method can be enhanced.
- Solar panels can be used in additional to increase the process rate.
- As the water depth increases or the turbidity increases the passage of sun rays through the water decreases thus alternative methods to pass the heat to the tubes can be designed.

### 5. CONCLUSION

Thus this method was found to be effective to some extent. If it is designed for large scale purposes like using it in rain water harvesting tanks, natural rain water can be utilized for domestic household purposes. Designing this

idea in domestic sewage paths may help in cleaning the contaminated water in a simpler way.

### 6. REFERENCES

1. Max Troell, The Royal Swedish Academy of Sciences Stockholm Resilience Center, Stockholm University- Integrated marine and brackish water aquaculture in tropical regions: research, implementation and prospects.
2. Qi Guan, Jiaoyu Liu, Juliang Liang, Yan Zhou - The Implementation of Water Cycle Control for 100KW Fuel Cell Test System.
3. Sandra Upson - Wizards of the water cycle, IEEE Spectrum, Volume: 47 , Issue: 6 , June 2010.
4. R. Venkatesana, N.R. Nagarajanb, K. Pasa, Y.-B. Yic , A.M. Sastryc , H.S. Foglera, A Department of Chemical Engineering, University of Michigan, 2300 Hayward Street Room 3074, Ann Arbor, MI 48109-2136, USA ExxonMobil Upstream Research Company, Houston, TX, USA department of Mechanical Engineering, University of Michigan, Ann Arbor, MI, USA - The strength of paraffin gels formed under static and flow conditions.
5. Simone Bastianoni, Laura Fugaro, Ilaria Principi, Marco Rosini - The artificial water cycle: Energy analysis of waste water treatment.